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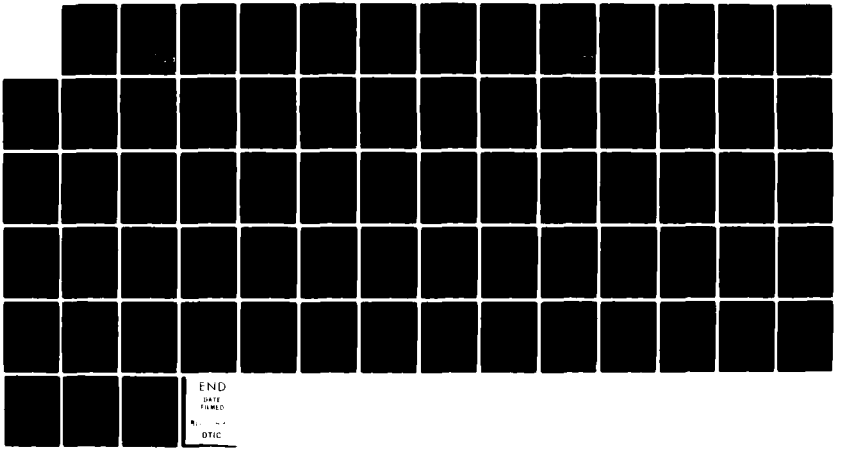
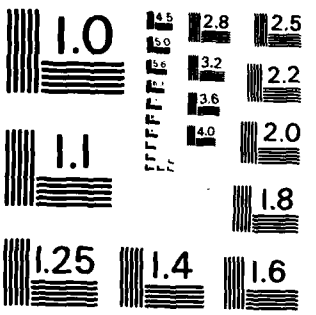


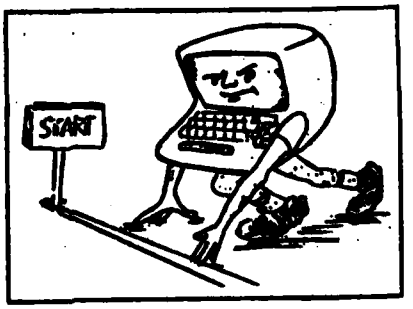


USAFA TR 83-14

REPORT OF THE

FACULTY WORKING GROUP ON COMPUTERS

1 JUNE 1983



REPORT OF THE FACULTY WORKING GROUP ON COMPUTERS

1 JUNE 1983

INTRODUCTION:

The faculty working group on computers was established in September 1982 by Colonel Wittry with General Orth's approval. Its charter is to advise the Dean on computer related matters, such as distributed computer resources. This document addresses the need for cadet and faculty personal computers, networking of those computers in conjunction with existing mainframes and some suggestions for implementation.

NEED:

As the technological complexity of the world increases, the needs of the students and faculty of the US Air Force Academy center around the importance of being able to use technology itself as a high-powered tool designed to increase productivity. Who can imagine a carpenter engaged in constructing a home today without the use of a power saw?! Yet, just as a modern carpenter would be in dire straits without modern tools of the trade when facing competition, so will an air force of tomorrow face potential enemies from an extremely negative position if technology is not used to good end. Indeed, as a recent Defense Science Board report concluded, if the U.S. does not increase its training effectiveness through the use of high technology, then we should be prepared to "have our chain yanked by Moscow."

The Air Force of tomorrow promises to be subject to the same information overload that is overtaking society in general. If tomorrow's leaders are to be effective in solving the yet unconceived problems, then the educational process must be adjusted in such a manner so as to prepare these leaders to function under conditions that can hardly be imagined today. Just as the private sector is demonstrating the usefulness of the personal computer, so should ways be found to increase the individual productivity of the future Air Force officer, both while a student at the Air Force Academy and on the job in the future.

Our most pressing need at the Air Force Academy is to use resources available to make cadets and faculty more efficient. The bottom line in education is that efficiencies are demanded: efficiencies, since personnel time is valuable and the "proverbial learning curve" must, by the necessity of learning more and more, be compressed in time such that the learning curve slope becomes steeper and steeper; efficiencies, since high technology has produced the hardware to be efficient in education and that hardware is available now.

Efficiencies can be realized immediately by providing electronic services which cadets and faculty do not now have. Those electronic services which we believe will produce the needed efficiencies, with a short narrative on each, are listed below.

1. Word Processing or Document Production

A considerable amount of cadet time is spent writing, revising, editing, and correcting documents for academic classes and for military

studies. By providing readily available sophisticated word processing services to the cadet, he/she can greatly decrease the time for draft and correction of each of these papers. Instructors, of course, in their day-to-day activities produce course materials such as instructional handouts, quizzes, etc. Readily available word processing systems can make the instructor much more efficient in his day-to-day document production.

If the means to communicate between cadet computers and instructor computers is readily available, i.e., a networked system, it is possible for the instructor to inspect, grade and return the paper to the cadet, all electronically. Of course, communication of documents between Dean and Departments and all other forms of paper document communication here at the Academy could be done electronically as well.

The obvious return of a networked, distributed system is much more efficient production, editing and transmittal of documents, which all of us, students and faculty alike, spend perhaps 30% of our time doing.

2. Computer/Information Processing

In the ever-increasing technological world of the Air Force Academy, instructors and cadets are required to become more sophisticated at problem solving in both the data-rich (social science/humanities) and computation-rich (engineering/science) areas. The computer, like the book, is powerful and has particular usefulness in the instructional setting. It can be used to access large data bases, to be very selective, to categorize information, to reorder information, to compute new results based on information, etc. Each academic discipline makes use of the computer in different ways. More than the book, the computer can get in the way of education if access is difficult or use is boring and tedious, or if the student uses the computer inappropriately. In the appropriate academic environment to encourage computer use, the computer must be readily available, easy to use and provide a stimulating, almost friendly environment. The user must have ready, fast access to available data bases and software that allows him to do necessary manipulation or computation.

3. Personal Software Production

Readily available computing resources allow the user to become much more proficient in software production (software which can make the user more efficient in the Academy setting). Many examples exist but suppose we look at a typical squadron job such as element leader. Assume that an element leader produces a piece of software which does all of his daily/weekly/monthly administrative duties. He finds that his time spent on element leader administrative duties has been reduced by factors of 50 or 60. He gives his piece of software to all the other element leaders in the wing and this efficiency is multiplied. Another example--suppose a department develops administrative software to keep track of their budget, curriculum, cadets in their major and progress, personnel under consideration for assignment to the department, etc. And then, the department finds its total administration time spent has been reduced by a factor of 10 or 20. The department makes this software available to all other departments and the efficiencies are again multiplied.

The key to this type of software production and to innovative approaches to problem solutions by use of the computer is through widely dispersed, easily accessible computer resources. The result is increased efficiency.

4. Computer-Based Education

Extensive use has been made of the existing Computer-Based Education system that was installed in the summer of 1980. The use is growing and an expansion of the system is inevitable. Several components of computer-based education must be centralized and several components must be specialized in order to execute specialized courseware that is very expensive but pedagogically sound. In other words, particular attention must be given to computer-based education in the planning process. For example, expensive high resolution graphics capabilities are required by certain disciplines. Extensive computer management of the education process is required in other disciplines. Still others require dynamics, motion, video disc controllers, voice synthesizers, etc. We do not expect to satisfy all of the requirements in computer-based education with one distributed computer system for many years. Perhaps the personal computer of 1990 will be a machine that will satisfy all of the requirements of computer-based education.

5. Computer Literacy

The increasing dependence of AF weapons systems on computers for information acquisition, processing, and presentation makes the AF officer not conversant with computers obsolete in the operations arena. Our graduates will eventually operate ever more sophisticated computer-based weapons systems, train and lead others in computer-based systems and make key decisions in their acquisition. It is absolutely imperative that our graduates have the maximum computer familiarity we can give them. We believe this computer literacy can only be accomplished through daily, unlimited access to computers. It requires a change in the thinking process so that the cadet thinks of his computer tool when considering almost any type of problem. He/she should develop a deep appreciation of the computer's capabilities and limitations which can only be acquired through extensive computer use.

We want our graduates to have the experience, knowledge and confidence to know when to question a result from a computer-based system and when to act according to a computer-based system's recommendation. It could be a matter of life or death.

RECOMMENDATION:

In order to satisfy most of the issues implicit in the above five needs, we recommend a personal computer network for faculty and cadets. This network would consist of modern, personal computers purchased or leased for the faculty by the institution to remain at the institution and purchased by the cadet for use here at the Academy and later use in the Air Force. We would also spend institutional money on wiring, disc drives and communications equipment to link the dormitories with Fairchild Hall.

We envision the cadet paying for his computer over the course of his four years here and then taking it with him after graduation. This system has several advantages over institutional purchase.

First, with the fast moving personal computer market comes rapid obsolescence of computers due to new model introduction. Hence, the normal eight-year life of computer systems in the Air Force is intolerable in this environment. Allowing cadets to purchase their machines makes a change in models or computers much easier and assures us that each entering class can have the most desirable features available for their money.

Second, the cadet must take the personal responsibility for his own machine, to protect it, maintain it and care for it just as he does any other item of personal equipment. We can, of course, make maintenance easier for him by insisting that the contract includes a provision for local maintenance.

Third, the cadet can take a portable type, personally-owned machine with him when he goes on leave in the summer, Christmas, Spring Break, or even a weekend pass. The machine is his/hers and they can treat it just as they would their own stereo equipment.

Fourth, the institution will not concern itself with how the cadet uses his machine, i.e., if he wants to play computer games, then he plays computer games. As long as he does not access the central computers to do something inappropriate, he has almost complete freedom with his machine.

In summary, everyone benefits from a cadet-owned machine. The institution saves money and administrative costs in trying to control the use of government-owned equipment. We also do not have the obsolescence problem which we otherwise would have. The cadet benefits since he has a piece of personal equipment with which he has much greater freedom than if it were government-owned.

We envision a system consisting of our current mainframe computers coupled to cadet personal computers. The personal computers (PC) will all be networked together in such a way that file transfer would be possible from PC to PC or from mainframe to PC or with disk files and networking from centralized disks to PC.

SOME OTHER ISSUES:

1. Transportability

How do we maintain commonality of hardware such that software developed for first generation microcomputers runs on second generation computers. We believe that this problem, which has always been with us when purchasing new computers, will be solved through a combination of hardware and software. Most of the newest personnel computers on the market today are built with several microprocessors and can execute under the control of several operating systems. The industry trend is certainly pointing to making this a non-problem.

2. New Features

It is desirable to plan for future delivery over the distributed network, video materials as well as audio, either synthesized or human. Hence, planning for the appropriate wiring should take these future plans into account as much as possible.

3. Honor

Electronic file transfer will make it far easier for widespread cheating to take place without some rather sophisticated safeguards. Since the computers will be used for word processing, the problem transcends current difficulties with computer program copying. Papers and lab reports from many disciplines could be copied. Availability of the computers, ease of access and the privacy of a cadet's own room might be factors making cheating easier.

Copying a copyright software (a common practice among computer hobbyists) is stealing. We must adopt a comprehensive policy to address this issue.

4. Commitment

We need a faculty wide commitment to become computer literate. There is a disparity in thought between those in the faculty who have embraced the new personal computers and those who have not. If we invest in a distributed system and provide ready, unlimited access to computer systems, we expect the faculty must be fully committed to using the system to achieve the desired efficiencies.

5. Training

How to train cadets and faculty to use a distributed computer network should be relatively simple as systems are becoming more "user friendly." However, a certain amount of orientation should be provided at the outset.

COSTS:

The Computer-in-the-Dorm Committee on which two of us (McCann and Stevens) represent the faculty has outlined five alternatives to accomplish the distributed computer network. We support the fifth alternative with the proviso that the computer be purchased by cadets. A detailed cost outline is not possible at this time, but we can piggyback on the CID report and modify the costs of alternative five as shown in the following chart. This chart includes total costs of networking, disk drive, bus interface units and institutional buy of faculty computers. After a decision has been made as to which alternative in the CID report is going to be supported, detailed planning and a complete cost-out will be accomplished.

In order to do a cost analysis the following assumptions are made:

1. We will introduce personal computers over a four-year period by requiring each member of an entering class to lease an institution-specified personal computer.

2. The lease will run for four years. The cadet will own the personal computer at the end of the four years.

3. During the four year period that the cadet leases the computer, he/she will have full ownership rights except in the event the cadet should disenroll before graduation. In order for the cadet to gain full ownership upon disenrollment, he/she must pay the balance remaining due on the personal computer. If the cadet chooses not to pay the balance due then full ownership reverts back to the USAFA.

4. Costs of the local area network (LAN) as well as engineering, management and control facility, furniture, mass storage, central processing unit and bus interface units will be assumed by USAFA.

5. USAFA will provide up-front money for the purchase of personal computers by cadets. In other words, in order for the cadet to buy over a four-year period financing must be obtained or the institution must provide the initial seed money.

6. The personal computer will cost $1500 which includes a printer.

COSTS

INITIAL OUTLAY FOR LOCAL AREA NETWORK (LAN)

Cable and Cable Installation	1,056,700
Base Civil Engineering and Allied Support	16,000
Engineering Costs	70,000
LAN Management and Control Facility	50,000
Furniture @ $400/room	880,000
Mass Storage CPU	250,000
Bus Interface Units	2,200,000
	$4,522,700

$/Computer	$/Yr	$/Mo	($/$10^6$) AF Outlay Start Up Costs
1000	250	20.83	2.249
1500	375	31.25	3.375
2000	500	41.66	4.498
2500	625	50.75	5.623
3000	750	62.49	6.747

Example $1500/Computer

Spend $1500/computer for 1500 cadets/yr = $2.25 x$10^6$/yr

Assume cadet takes 4 years to buy computer with equal installments over 48 months

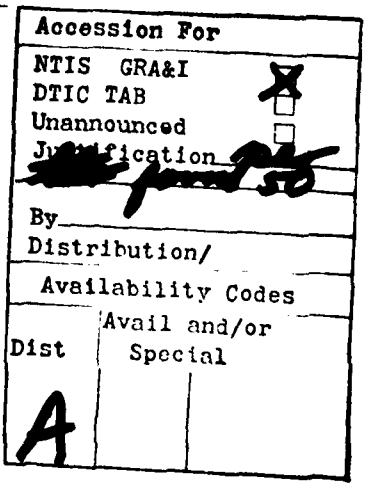
Yr.	Credit ($/$10^6$)	Debit ($/$10^6$)	Balance ($/$10^6$)
1	0.5625	-2.25	-1.688
2	1.1250	-2.25	-2.813
3	1.6875	-2.25	-3.375
4	2.25	-2.25	-3.375

USAFA OUTLAY FOR FACULTY COMPUTERS

Assume $1500/computer x 650 = $975,000

Total Outlay Which Does Not Include Maintenance

LAN	$ 4,522,700.
Start-Up Costs	3,375,000.
Faculty Computers	975,000.
	$ 8,872,700.



The members of the Faculty Working Group on Computers:

Lt Col Thomas E. McCann, DFSR, Chairman
Major Lawrence G. Jones, DFCS
Major Jonathan L. Stevens, DFSEC
Captain Michael D. Bush, DFF
Captain Terry L. Caipen, DFEM
Captain Larry P. Davis, DFC
Captain William P. Marshak, DFBL
Captain Milton C. Nielsen, CWIS

have been guided by the attached charter.

FACULTY WORKING GROUP ON COMPUTERS

Advise appropriate DF individuals and agencies on:

a. Acquisition of computers and peripherals (especially computer equipment generally referred to as personal computers, micro-computers and/or distributed computer systems)

b. Acquisition of software.

c. Production of software and courseware by DF personnel

d. Other computer related issues of importance to the faculty

The working group will consist of a Chairman, appointed by the Dean or Vice Dean, Director of the Education and Research Computer Center and at least four other faculty officers appointed by the Chairman.

The working group will report to the Dean of the Faculty each August, outlining its recommendations. This report may be in any format deemed appropriate and address any current or future computer issues of importance to the faculty.

APPENDIX I

The faculty working group wanted a feel for the entire faculty's view on personal computers and the role they should play at the Academy. Capt Bill Marshak, a member of the committee and an experimental psychologist, made the following survey, administered it and reported the results. His conclusions are included as the narrative in the first report which Bill presented at the AF Technology in Training and Education Conference in April.

The Faculty Role in Implementing Distributed Computer Systems

by

William P. Marshak, Captain, USAF

Associate Professor

Department of Behavioral Sciences and Leadership

U.S. Air Force Academy, Co 80840

25 April 1983

Abstract

Many academic institutions are considering or already implimenting large scale distributed computing systems to include student owned microcomputers. The potential benefit of these computers to the education process is enormous, but so are the risks. A real danger is that expensive hardware will be underutilized for lack of applications. Faculty involvement with the new computing resources is the key to effective utilization.

Committees within the U.S. Air Force Academy are now considering various distributed computing options. A survey of the Academy faculty was conducted to assess their readiness and willingness to use the proposed systems. The survey summarizes the available faculty resources to support distributed computer applications and their opinions concerning implementation plans.

Numerous academic institutions have announced plans to require students to buy microcomputers. This has been especially true of schools with engineering curricula. The Air Force Academy, through two separate but coordinated committees, is considering applications of distributed computing systems. Such distributed systems include terminals networked to mainframes or minicomputers, networked microcomputers or stand alone microcomputers. To support the efforts of the Faculty Working Group on Computers, a survey of the faculty's 574 officers was conducted to 1) determine their readiness to support a large scale distributed computer resource, 2) assess their willingness to tackle the problems of implimenting and adequately utilizing the new resource, and 3) gather opinions concerning whether a distributed system should be implimented and what kind of system would best serve the education process.

Each faculty member received an individually addressed survey and return envelope. After the requested 10 day return period, 366 responses (64 percent) returned the survey, a percentage comparable to other full faculty surveys conducted by the Behavioral Sciences department. With an issue which can evoke strong feelings as computers in academics, the problem existed as to whether those responding were representative of the entire faculty. That is, would pro- or anti-computer faculty members be more likely to respond?

The possiblity of sample bias was tested by comparing the percentage responding from four departments, one each from the faculty's four divisions. The departments were Computer Science from the Basic Sciences, Engineering Mechanics from the Engineering Sciences, History from the Humanities and Behavioral Sciences and Leadership from the Social Sciences. The proportions responding were comparable for all four departments, suggesting that inspite of differing involvements with computers caused by academic area, comparable number of officers responded. There was no way to preclude selective

responding within each department. However, we will assume the sample is representative.

The overall faculty response to the survey questions are included in the attachement to this report. Rather than individually describe each question, this report will summarize and highlight the results.

The readiness of the Air Force Academy faculty to support an extensive computer applications can first be measured by their perception of a need for such a system. Currently, cadets have one required course in Computer Science which introduces the principles of computing and teaches the PASCAL language. Many core cirriculum and adademic major courses require application of programming skills or teach new user skills. Question 26 asks whether greater computer exposure is needed in the cirriculum and 74 percent felt that some kind of upgrading is needed.

What exactly is the readiness of the faculty to support the upgrading process. Questions 6 and 7 address the faculty experience as computer "users" and computer "programmers". There are 87 percent of the faculty who have computer usage experience, but only 69 percent who have programming experience. Over two-thirds of the faculty used computers in their graduate education, with a similar percent using them at the present time (question 11 and 12). Most, but not all, of these computer users (58 percent of the total sample) use computers as part of their faculty duties (question 13).

Effective utilization of an expensive distributed computing system will require as much faculty participation in the sytem as possible. Almost half the faculty is not using computers now. Nearly a third will require considerable training to make a significant contribution. Faculty computing skills will have to be upgraded to adequately use the new computing resources. This could be accomplished by requiring officers sponsored to graduate school to get computer experience appropriate to their

academic area and planning on a significant faculty education program.

Participation in planned projects is not a problem on a military faculty, since academic independence is sacrificed as part of the military structure. However, it would be short sighted not to consider the feelings of those who will shoulder the burden of implimenting such an extensive project. The willingness of the faculty to participate in the planned systems is addressed in three questions, each dealing with a different expansion option discussed in the Faculty Working Group on Computers. These options were a) a system of networked terminals connected to mainframe or minicomputers (questions 27-29), b) issue or purchase of microcomputers (with or without networking) to cadets (questions 30-33) and c) issue of microcomputers to the faculty for classroom application (questions 34-37). Over 80 percent of the faculty sample responded favorably to the participation questions (questions 31 and 35), with 10 percent willing to spend their own money to purchase a system.

To see if the interest in computer participation differed across academic interests, the same four departments mentioned before were compared. Although there were significant differences in computer usage and programming experience, there were no differences in perceived need for more computer experience or in williness to participate. This indicates a strong willingness amongst faculty members to participate in a new distributed computing system. However, only 58 percent are now active on Academy computers. The size of verbal support must be tempered by the limited commitment now given to current systems.

The last issue of the survey, opinions on a new distributed computing system, is addressed in a number of questions. First, there is no clear choice among the three options queried above. Approximately 10 percent favored most strongly terminals, cadet

microcomputers and faculty microcomputers. What does emerge from the questions which ask about desired features (questions 33 and 36) is that there is no desire to cut corners. Graphics capacity, higher order languages, 80x24 text display and computing power were all found to be desirable. This would seem to eliminate may of the low cost systems currently available on the market place. Compromising features for cost would not result in an effective final choice.

Finally, the responses to the open question 38 lead to a diverse range of topics. Many questioned the necessity for a major expenditure on computers and felt the money better spent elsewhere. Another often mentioned theme was the implications of a large distributed computer setup to cadet honor. The issue of software piracy in microcomputers, epidemic in the civilian community, has real legal and ethical issues if microcomputers were purchased. Another honor related issue is copying projects and papers, which would be easier to accomplish with microcomputers than with a terminal system. Many made strong arguments for particular systems, usually pointing to existing software bases suitable for their applications. Finally, there was a small but significant number who felt the survey did not ask the right questions or the resposes were slanted. The only response to this is that the survey required responses to get maximum information on issues before the Faculty Working Group on Computers from the respondent and it was admittedly assembled over a short time period because there was a immediate need for the information.

In summary, there is a perceived need by the Air Force Academy faculty for some kind of enhanced computer experience for cadets. There does seem to exist broad, but not complete support for implimenting a distributed computing system. No clear choice of system, whether terminals or microcomputers was stated, but a relatively powerful and full feature computer system is needed. The acquisition of the new computer system must

address more than just the choice of hardware and installation. A significant effort from the faculty, both in development effort and self education will be required for success. Finally, a wide range of peripheral but none the less important side issues such as honor, ethics and use of resources existing in the civilian community must be addressed.

FACULTY COMPUTER SURVEY

William P. Marshak, Capt., USAF

Department of Behavioral Sciences

and Leadership

April 11, 1983

Acknowledgements

This survey was wholey written and analyzed by microcomputers. The author wishes to thank Colonel William Rosenbach for use of his portable survey system on which the data was analyzed.

6. Computer experience as user (non programmer)
   a. none
   b. less than one year
   c. one to three years
   d. three to five years
   e. more than five years

STATISTICS AND GRAPH FOR >>> Q6 YRS NON-PRO USE
FREQUENCY ANALYSIS

TEST 1 GROUP 1 N= 47.0 .13

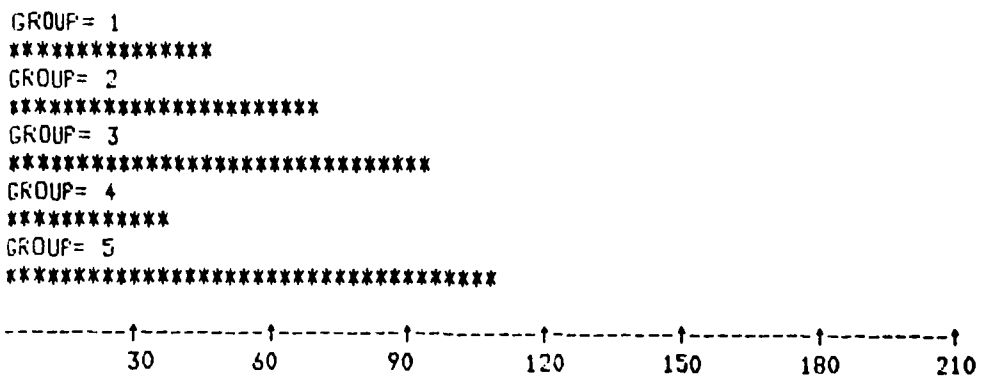
TEST 1 GROUP 2 N= 70.0 .19

TEST 1 GROUP 3 N= 94.0 .26

TEST 1 GROUP 4 N= 39.0 .11

TEST 1 GROUP 5 N= 111.0 .31

n=361



7. Computer experience at a programmer (responses as question 6)

a. none
b. less than one year
c. one to three years
d. three to five years
e. more than five years

STATISTICS AND GRAPH FOR >>> Q7 YRS PRO USE
FREQUENCY ANALYSIS

TEST 2 GROUP 1 N= 105.0 .31

TEST 2 GROUP 2 N= 59.0 .17

TEST 2 GROUP 3 N= 56.0 .16

TEST 2 GROUP 4 N= 27.0 .08

TEST 2 GROUP 5 N= 99.0 .29

n=346

GROUP= 1
****
GROUP= 2
****
GROUP= 3
****
GROUP= 4
****
GROUP= 5
****

30 60 90 120 150 180 210

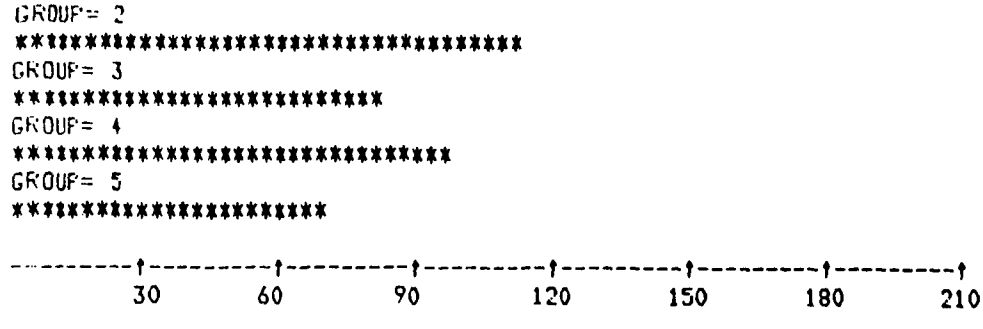
11. If you have attended graduate school, what role did computers play in that graduate education?

1. I have not attended graduate school.
2. Computers played little or no role in my graduate education.
3. Computers played a peripheral role in my graduate education, such as word processing or occasional statistics.
4. Computers played a major role in my graduate education.
5. Computers played a central or crucial role in my graduate education.

STATISTICS AND GRAPH FOR >>> Q11 GRAD ROLE OF COM
FREQUENCY ANALYSIS

TEST 3 GROUP 1 HAS N=1 OR 0	.00
TEST 3 GROUP 2 N= 113.0	.31
TEST 3 GROUP 3 N= 83.0	.23
TEST 3 GROUP 4 N= 99.0	.27
TEST 3 GROUP 5 N= 71.0	.19

n=366



12. Do you use a computer (personal, mini or mainframe)?
1. yes 2. No (go to Question 25)

STATISTICS AND GRAPH FOR >>> Q12 COMP USE
FREQUENCY ANALYSIS

TEST 4 GROUP 1 N= 241.0 .66

TEST 4 GROUP 2 N= 123.0 .34

n=364

GROUP= 1
****
GROUP= 2
****

---------↑---------↑---------↑---------↑---------↑---------↑---------↑
30 60 90 120 150 180 210

13. Is your computer use part of your Faculty work?
1. yes 2. No (go to Question 21)

STATISTICS AND GRAPH FOR >>> Q13 COMP USE FAC
FREQUENCY ANALYSIS

TEST 5 GROUP 1 N= 214.0 .86

TEST 5 GROUP 2 N= 36.0 .14

n=250

GROUP= 1
****
GROUP= 2
****

---------↑---------↑---------↑---------↑---------↑---------↑---------↑
30 60 90 120 150 180 210

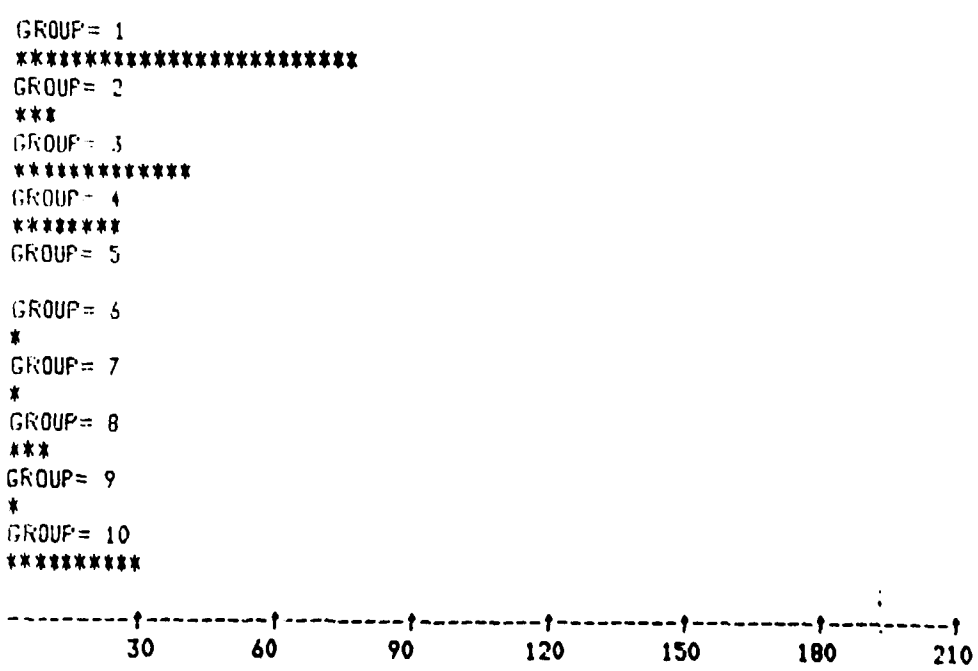
14. Which computer systems do you use or program the most at the Academy?

1. Burroughs 6900
2. VAX A
3. VAX B
4. WP70
5. Intel MDS
6. Terak (stand alone)
7. Univac 1100
8. Hewlett Packard
9. PDP - 11
10. other

STATISTICS AND GRAPH FOR >>> Q14 PRI ACAD COMP
FREQUENCY ANALYSIS

TEST 1 GROUP 1 N=	76.0	.35
TEST 1 GROUP 2 N=	12.0	.05
TEST 1 GROUP 3 N=	41.0	.19
TEST 1 GROUP 4 N=	27.0	.12
TEST 1 GROUP 5 N=	2.0	.01
TEST 1 GROUP 6 N=	6.0	.03
TEST 1 GROUP 7 N=	4.0	.02
TEST 1 GROUP 8 N=	12.0	.05
TEST 1 GROUP 9 N=	5.0	.02
TEST 1 GROUP 10 N=	33.0	.15

n=218



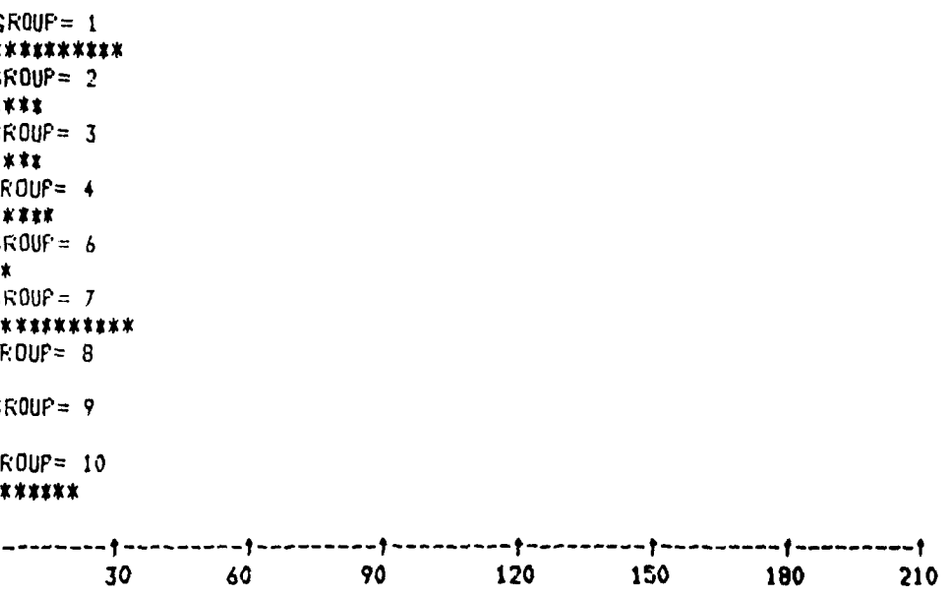
15. If you use a second system at the Academy, which one is it?
(responses as question 14)

1. Burroughs 6900
2. VAX A
3. VAX B
4. WP70
5. Intel MDS
6. Terak (stand alone)
7. Univac 1100
8. Hewlett Packard
9. PDP - 11
10. other

STATISTICS AND GRAPH FOR >>> Q15 SEC ACAD COMP
FREQUENCY ANALYSIS

TEST 2 GROUP 1 N=	33.0	.22
TEST 2 GROUP 2 N=	14.0	.09
TEST 2 GROUP 3 N=	13.0	.09
TEST 2 GROUP 4 N=	16.0	.10
TEST 2 GROUP 5 HAS N=1 OR 0		.00
TEST 2 GROUP 6 N=	9.0	.06
TEST 2 GROUP 7 N=	36.0	.24
TEST 2 GROUP 8 N=	2.0	.01
TEST 2 GROUP 9 N=	5.0	.03
TEST 2 GROUP 10 N=	24.0	.16

n=152



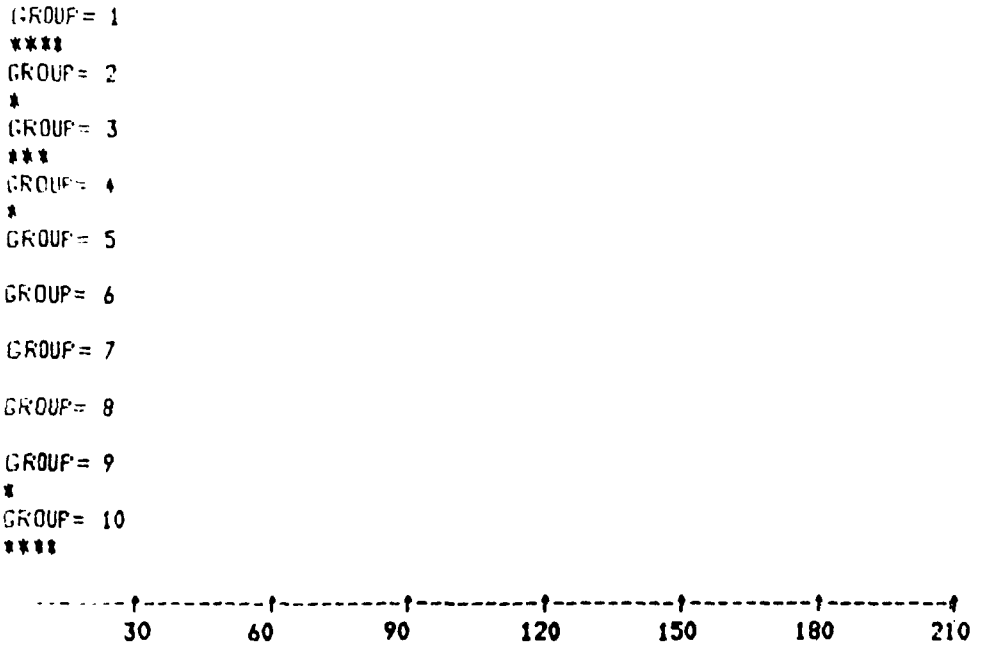
16. If you use a third system at the Academy, which one is it? (responses as question 14)

1. Burroughs 6900
2. VAX A
3. VAX B
4. WP70
5. Intel MDS
6. Terak (stand alone)
7. Univac 1100
8. Hewlett Packard
9. PDP - 11
10. other

STATISTICS AND GRAPH FOR >>> Q16 TERT ACAD COMP
FREQUENCY ANALYSIS

TEST 3 GROUP 1 N=	13.0	.21
TEST 3 GROUP 2 N=	4.0	.06
TEST 3 GROUP 3 N=	11.0	.17
TEST 3 GROUP 4 N=	5.0	.08
TEST 3 GROUP 5 N=	3.0	.05
TEST 3 GROUP 6 N=	2.0	.03
TEST 3 GROUP 7 N=	2.0	.03
TEST 3 GROUP 8 N=	3.0	.05
TEST 3 GROUP 9 N=	6.0	.09
TEST 3 GROUP 10 N=	14.0	.22

n=63



17. What is the principle use of the the primary computer system?
    1. classroom teaching
    2. computer assisted instruction development
    3. word processing
    4. research
    5. other

STATISTICS AND GRAPH FOR >>> Q17 CLASS USE
FREQUENCY ANALYSIS

TEST 4 GROUP 1 N= 65.0 .29

TEST 4 GROUP 2 N= 46.0 .21

TEST 4 GROUP 3 N= 43.0 .19

TEST 4 GROUP 4 N= 44.0 .20

TEST 4 GROUP 5 N= 25.0 .11

n=223

GROUP= 1
****
GROUP= 2
****
GROUP= 3
****
GROUP= 4
****
GROUP= 5
****

---------†---------†---------†---------†---------†---------†---------†
30 60 90 120 150 180 210

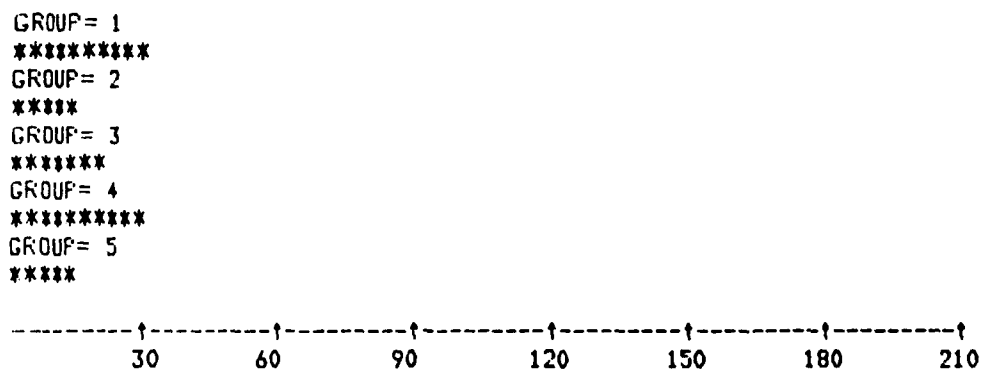
18. What is the principle use of the second Academy computer system? (responses as question 17)

1. classroom teaching
2. computer assisted instruction development
3. word processing
4. research
5. other

STATISTICS AND GRAPH FOR >>> Q18 SEC PRIN USE
FREQUENCY ANALYSIS

TEST 5 GROUP 1 N=	32.0	.26
TEST 5 GROUP 2 N=	18.0	.15
TEST 5 GROUP 3 N=	23.0	.19
TEST 5 GROUP 4 N=	31.0	.26
TEST 5 GROUP 5 N=	17.0	.14

n=121



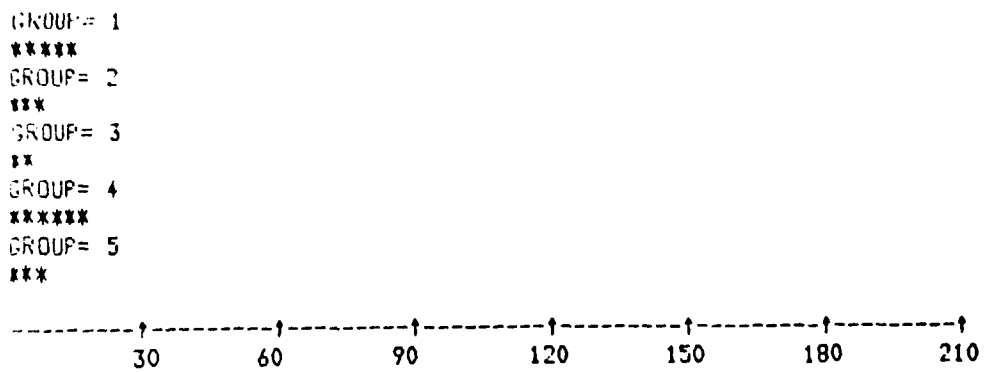
19. What is the principle use of the third Academy computer system, if you use one? (responses as question 17)

1. classroom teaching
2. computer assisted instruction development
3. word processing
4. research
5. other

STATISTICS AND GRAPH FOR >>> Q19 TERT PRIN USE
FREQUENCY ANALYSIS

TEST 1 GROUP 1 N=	18.0	.27
TEST 1 GROUP 2 N=	10.0	.15
TEST 1 GROUP 3 N=	7.0	.11
TEST 1 GROUP 4 N=	19.0	.29
TEST 1 GROUP 5 N=	12.0	.18

n=66



20. Does your computer use include a personal (non-government owned) computer?

1. yes 2. No (go to question 25)

STATISTICS AND GRAPH FOR >>> Q20 USE PERSONAL
FREQUENCY ANALYSIS

TEST 1 GROUP 1 N= 97.0 .44

TEST 1 GROUP 2 N= 122.0 .56

n=219

GROUP= 1
****
GROUP= 2
****

```
---------†---------†---------†---------†---------†---------†---------†
         30        60        90        120       150       180       210
```

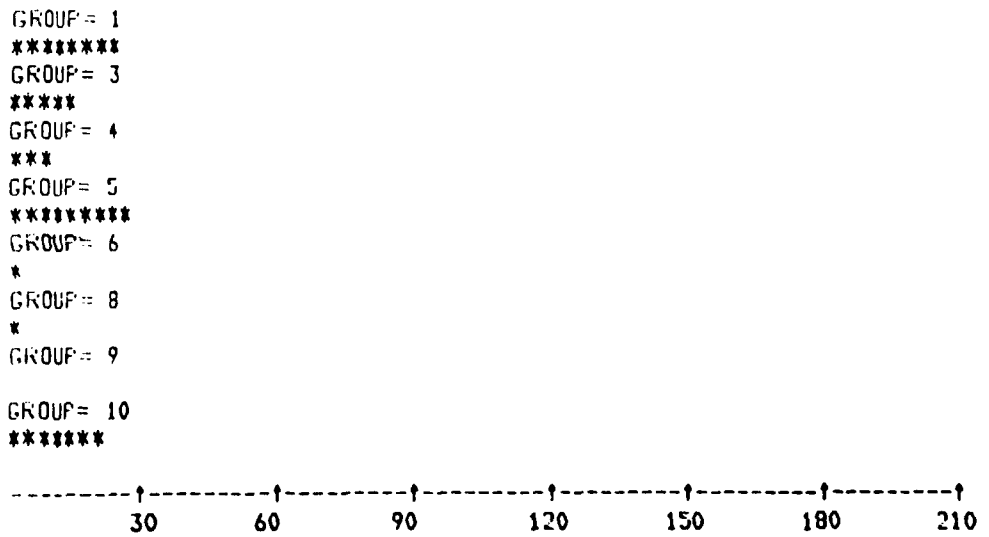
21. Which personal computer do you use or own?

1. Apple II
2. Commodore Pet (any variation)
3. TRS-80 (any variation)
4. Heath Computer (any variation)
5. Texas Instrument 99/4
6. Commodore VIC
7. Osborne I
8. IBM Personal Computer
9. S-100 Computer
10. Other

STATISTICS AND GRAPH FOR >>> Q21 OWN PERS COMP
FREQUENCY ANALYSIS

TEST 2 GROUP 1 N=	27.0	.23
TEST 2 GROUP 2 HAS N=1 OR 0		.00
TEST 2 GROUP 3 N=	17.0	.14
TEST 2 GROUP 4 N=	12.0	.10
TEST 2 GROUP 5 N=	29.0	.25
TEST 2 GROUP 6 N=	4.0	.03
TEST 2 GROUP 7 HAS N=1 OR 0		.00
TEST 2 GROUP 8 N=	4.0	.03
TEST 2 GROUP 9 N=	2.0	.02
TEST 2 GROUP 10 N=	23.0	.19

n=118



22. Do you ever use your personal computer to support academic activity?

1. yes 2. No (go to question 24)

STATISTICS AND GRAPH FOR >>> Q22 IN ACADEMICS?
FREQUENCY ANALYSIS

TEST 2 GROUP 1 N= 80.0 .65

TEST 2 GROUP 2 N= 43.0 .35

n=123

GROUP= 1
****
GROUP= 2
****

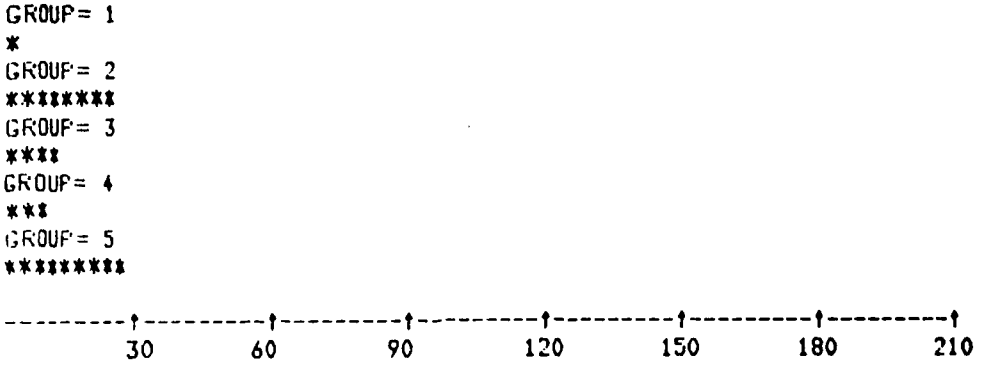
```
---------+---------+---------+---------+---------+---------+---------+
         30        60        90        120       150       180       210
```

23. What is the primary academic use of your personal computer?

1. classroom demonstration
2. grade tracking and records
3. computer assisted instruction
4. research
5. other

STATISTICS AND GRAPH FOR >>> Q23 ACAD USE OF PC
FREQUENCY ANALYSIS

TEST 3 GROUP 1 N=	4.0	.03
TEST 3 GROUP 2 N=	26.0	.21
TEST 3 GROUP 3 N=	13.0	.11
TEST 3 GROUP 4 N=	11.0	.09
TEST 3 GROUP 5 N=	28.0	.23
		n=82



24. What do you see as the future role of microcomputers in the faculty and the instruction process.

1. no place in classroom
2. limited role in classroom
3. unlimited potential in classroom

STATISTICS AND GRAPH FOR >>> Q24 FUTURE ROLES
FREQUENCY ANALYSIS

TEST 4 GROUP 1 HAS N=1 OR 0 .00

TEST 4 GROUP 2 N= 48.0 .36

TEST 4 GROUP 3 N= 85.0 .64

n=133

GROUP= 2
****
GROUP= 3
****

```
---------+---------+---------+---------+---------+---------+---------+
         30        60        90        120       150       180       210
```

25. How would you assess the role of all computers in the cadet education process?

1. most cadets have little or no appreciation of the usefulness of computers

2. most cadets develop an appreciation of computers .

3. most cadets develop some proficiency in computers and can use them in the education process

4. most cadets are computer proficient and integrate them into their education

STATISTICS AND GRAPH FOR >>> Q25 COMP IN CADET ED
FREQUENCY ANALYSIS

TEST 5 GROUP 1 N=	62.0	.17
TEST 5 GROUP 2 N=	154.0	.43
TEST 5 GROUP 3 N=	140.0	.39
TEST 5 GROUP 4 N=	3.0	.01
		n=359

GROUP= 1
****
GROUP= 2
****
GROUP= 3
****
GROUP= 4

30 60 90 120 150 180 210

26. Do you think greater exposure to and use of computers is needed in the cirriculum at the Academy?

1. no, current use is adequate.
2. yes, some kind of upgrading is needed.

STATISTICS AND GRAPH FOR >>> Q26 MORE COMP EXP
FREQUENCY ANALYSIS

TEST 1 GROUP 1 N= 93.0 .26

TEST 1 GROUP 2 N= 265.0 .74

n=358

GROUP= 1
****
GROUP= 2
****

---------†---------†---------†---------†---------†---------†---------†
30 60 90 120 150 180 210

27. One proposal has been made to enhance and add terminals to the existing computer systems, possibly in the dormatories, to make the Academy computers more available to cadets. How do you feel about this proposal?

1. This would not change the quality of education at the academy.

2. This is one way to increase computer usage, but not the best way.

3. This is the best way to improve the education of cadets.

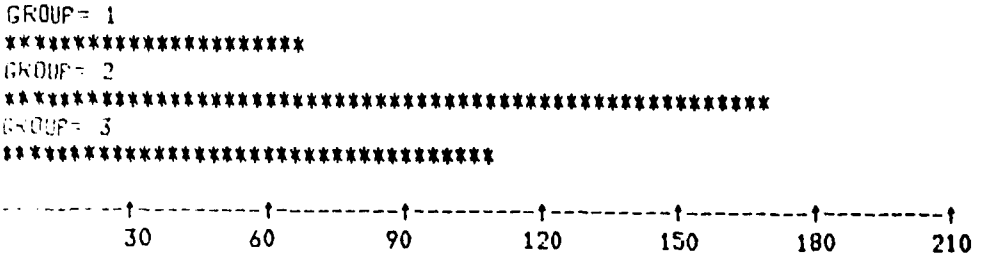
STATISTICS AND GRAPH FOR >>> Q27 TERMINALS
FREQUENCY ANALYSIS

TEST 2 GROUP 1 N= 69.0 .20

TEST 2 GROUP 2 N= 170.0 .49

TEST 2 GROUP 3 N= 110.0 .31

n=349



28. If the current systems were enhanced, what is the most important feature the new system should have?

1. word processing
2. CAI to include graphics
3. graphics alone
4. general computing capacity
5. real-time data processing
6. other

STATISTICS AND GRAPH FOR >>> Q28 PRI TERM FEAT
FREQUENCY ANALYSIS

TEST 3 GROUP 1 N= 86.0 .25

TEST 3 GROUP 2 N= 133.0 .38

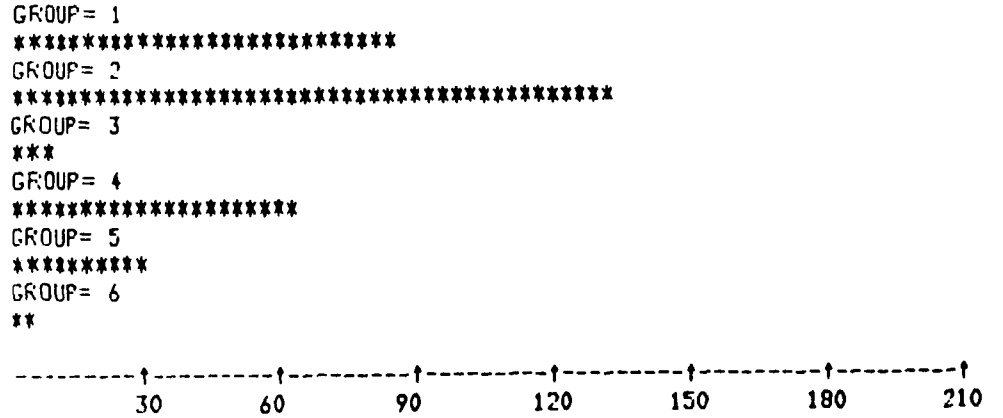
TEST 3 GROUP 3 N= 10.0 .03

TEST 3 GROUP 4 N= 64.0 .18

TEST 3 GROUP 5 N= 31.0 .09

TEST 3 GROUP 6 N= 8.0 .02

n=332

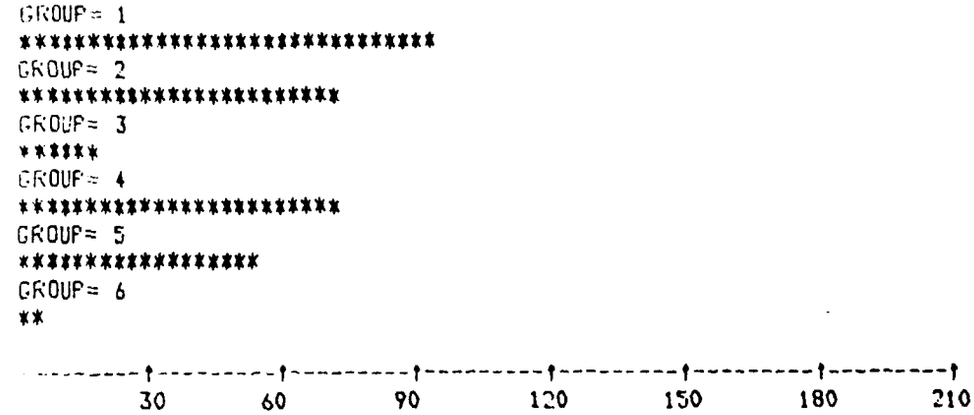


29. What is the second most important feature of enhanced central systems? (use the responses from question 28)

1. word processing
2. CAI to include graphics
3. graphics alone
4. general computing capacity
5. real-time data processing
6. other

STATISTICS AND GRAPH FOR >>> Q29 SEC TERM FEAT
FREQUENCY ANALYSIS

TEST 4 GROUP 1 N=	95.0	.27
TEST 4 GROUP 2 N=	75.0	.21
TEST 4 GROUP 3 N=	19.0	.05
TEST 4 GROUP 4 N=	74.0	.21
TEST 4 GROUP 5 N=	55.0	.16
TEST 4 GROUP 6 N=	9.0	.03
		n=327



30. A second proposal is under discussion for cadets to each receive/buy a microcomputer as part of their equipment. Which statement characterizes your opinion on this idea best?

1. This is an excellent idea and has great potential for improving cadet education and should be accomplished soon.
2. This is a good idea but should be cautiously explored for sometime in the future.
3. I have no feelings either way.
4. This is a poor idea and would be only of marginal use.

STATISTICS AND GRAPH FOR >>> Q30 CADET MICROS
FREQUENCY ANALYSIS

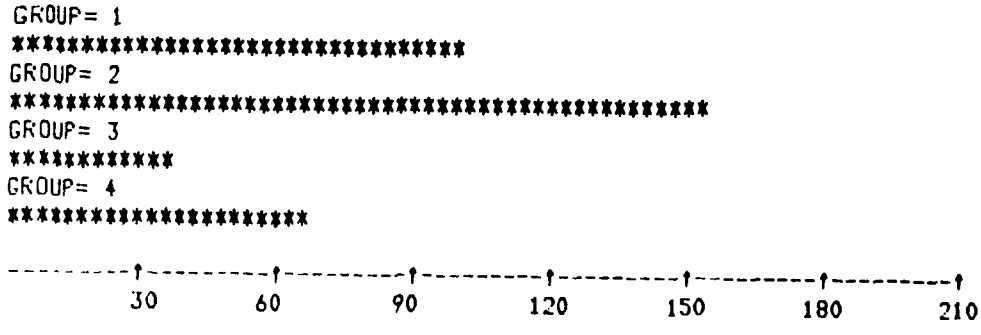
TEST 5 GROUP 1 N= 100.0 .27

TEST 5 GROUP 2 N= 156.0 .43

TEST 5 GROUP 3 N= 38.0 .10

TEST 5 GROUP 4 N= 69.0 .19

n=363



31. If the cadet computers were available, how would you react.
1. I would not get involved.
2. I would be willing to learn the computer system and develop educational materials for it, if a system were made available.
3. I would buy my own system and share in software development.

STATISTICS AND GRAPH FOR >>> Q31 C COMP REACT
FREQUENCY ANALYSIS

TEST 1 GROUP 1 N= 33.0 .09

TEST 1 GROUP 2 N= 273.0 .76

TEST 1 GROUP 3 N= 51.0 .14

n=357

GROUP= 1
****
GROUP= 2
****
GROUP= 3
****

---------†---------†---------†---------†---------†---------†---------†
30 60 90 120 150 180 210

32. Which feature do you think is most important in choosing a particular model for a cadet computer?

1. computing power
2. high resolution graphics
3. 80x24 screen for word processing
4. availability of higher order languages
5. other.

STATISTICS AND GRAPH FOR >>> Q32 CCOMP FEAT
FREQUENCY ANALYSIS

TEST 2 GROUP 1 N= 94.0 .28

TEST 2 GROUP 2 N= 38.0 .11

TEST 2 GROUP 3 N= 90.0 .27

TEST 2 GROUP 4 N= 77.0 .23

TEST 2 GROUP 5 N= 34.0 .10

n=333

GROUP= 1
****
GROUP= 2
****
GROUP= 3
****
GROUP= 4
****
GROUP= 5
****

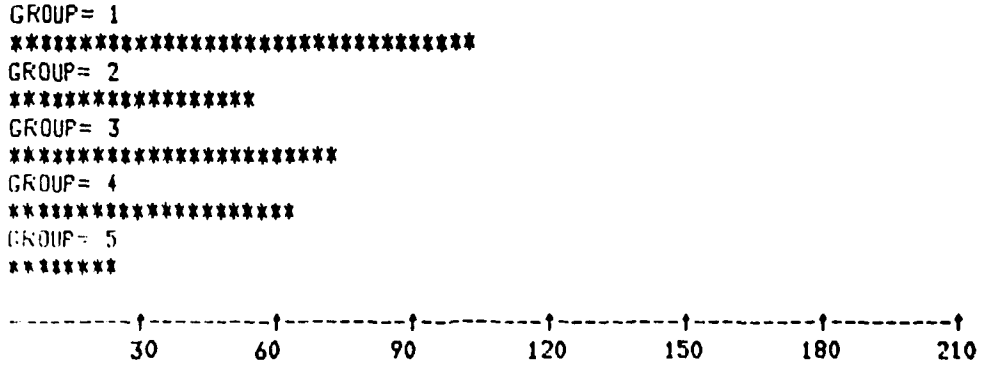
---------†---------†---------†---------†---------†---------†---------†
30 60 90 120 150 180 210

33. Which feature do you put as second most important in choosing a cadet computer? (use responses from Question 32)

1. computing power
2. high resolution graphics
3. 80x24 screen for word processing
4. availability of higher order languages
5. other

STATISTICS AND GRAPH FOR >>> Q33 SEC COMP FEAT
FREQUENCY ANALYSIS

TEST 3 GROUP 1 N=	103.0	.31
TEST 3 GROUP 2 N=	56.0	.17
TEST 3 GROUP 3 N=	73.0	.22
TEST 3 GROUP 4 N=	64.0	.19
TEST 3 GROUP 5 N=	26.0	.08
		n=322



34. Another proposal forwarded would buy microcomputers for the faculty for classroom support. Use the responses of question 27 to express your feelings.

1. This would not change the quality of education at the academy.
2. This is one way to increase computer usage, but not the best way.
3. This is the best way to improve the education of cadets.

STATISTICS AND GRAPH FOR >>> Q34 FAC COMP
FREQUENCY ANALYSIS

TEST 4 GROUP 1 N= 62.0 .18

TEST 4 GROUP 2 N= 166.0 .49

TEST 4 GROUP 3 N= 108.0 .32

n=336

GROUP= 1
****
GROUP= 2
****
GROUP= 3
****

30 60 90 120 150 180 210

35. If the faculty computer buy went through, how would you react to it? (use the responses to question 2830

1. I would not get involved.
2. I would be willing to learn the computer system and develop educational materials for it, if a system were made available.
3. I would buy my own system and share in software development.

STATISTICS AND GRAPH FOR >>> Q35 FAC COMP RESP
FREQUENCY ANALYSIS

TEST 5 GROUP 1 N= 34.0 .10

TEST 5 GROUP 2 N= 271.0 .80

TEST 5 GROUP 3 N= 34.0 .10

n=339

GROUP= 1
****
GROUP= 2
****
GROUP= 3
****

---------†---------†---------†---------†---------†---------†---------†
30 60 90 120 150 180 210

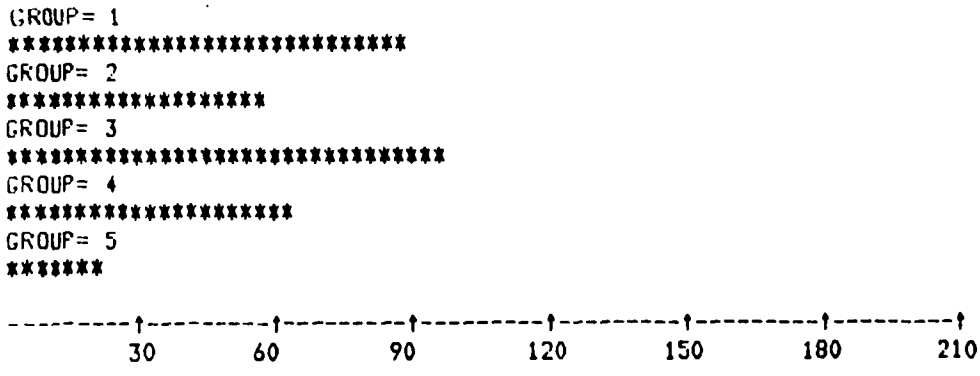
36. What feature do you think is most important for a faculty computer (use the responses to question 32)

1. computing power
2. high resolution graphics
3. 80x24 screen for word processing
4. availability of higher order languages
5. other

STATISTICS AND GRAPH FOR >>> Q36 FAC COMP FEAT
FREQUENCY ANALYSIS

TEST 1 GROUP 1 N=	88.0	.27
TEST 1 GROUP 2 N=	58.0	.17
TEST 1 GROUP 3 N=	97.0	.29
TEST 1 GROUP 4 N=	65.0	.20
TEST 1 GROUP 5 N=	23.0	.07

n=331



37. Which particular computer system do you think would best suit your needs to support you in the classroom (Use the responses to question 21).

1. Apple II
2. Commodore Pet (any variation)
3. TRS-80 (any variation)
4. Heath Computer (any variation)
5. Texas Instrument 99/4
6. Commodore VIC
7. Osborne I
8. IBM Personal Computer
9. S-100 Computer
10. Other

STATISTICS AND GRAPH FOR >>> Q37 WHICH SYSTEM
FREQUENCY ANALYSIS

TEST 2 GROUP 1 N= 85.0 .32

TEST 2 GROUP 2 N= 2.0 .01

TEST 2 GROUP 3 N= 14.0 .05

TEST 2 GROUP 4 N= 8.0 .03

TEST 2 GROUP 5 N= 15.0 .06

TEST 2 GROUP 6 N= 7.0 .03

TEST 2 GROUP 7 N= 7.0 .03

TEST 2 GROUP 8 N= 94.0 .35

TEST 2 GROUP 9 N= 2.0 .01

TEST 2 GROUP 10 N= 32.0 .12

n=266

GROUP= 1
****
GROUP= 2

GROUP= 3
****
GROUP= 4
**
GROUP= 5
****
GROUP= 6
**
GROUP= 7
**
GROUP= 8
****
GROUP= 9

GROUP= 10
****

38

---------†---------†---------†---------†---------†---------†---------†
30 60 90 120 150 180 210

APPENDIX II

Recently, Headquarters USAF - Directorate of Computer Resources - reported a small computer specification standard which is attached. This standard will guide us in any procurement action with respect to small computer systems.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C.
20330

REPLY TO ATTN OF: ACD

2 MAR 1983

SUBJECT: Small Computer Specifications

TO: ALMAJCOM/SOA/PLUS
(ADP Single Manager)

1. Our letter of 14 February 1983, subject "Acquisition of Small Computers," provided general plans for establishing small computer requirements contracts. The technical characteristics for the first contract, a general purpose system, were provided with that letter. Subsequently, the detailed specification for the system was distributed at the ADP Single Manager's Conference. That version was modified and released to industry on 14 March 83. Although the specification is still subject to change, the current version is attached for your information and use.

2. On the basis of this specification, request you provide us the following information by 15 April 1983.

a. Adjustments to your original quantity projections, if any, based on the specification versus the general characteristics.

b. An estimate of how many systems must be ordered between 15 and 30 September due to fiscal year-end funding or similar problems.

c. A point of contact within your organization.

3. We believe the specification addresses the majority of the concerns you raised in your earlier replies. In those cases where your planned acquisitions still depart from the general characteristics, your projects must be approved by AF/ACD on a case-by-case basis.

4. Our point of contact is Lt Col Jim Burgess, Autovon 225-5999.

FOR THE CHIEF OF STAFF

DONALD W. SAWYER, JR., Col, USAF
Acting Deputy Director
(Policy and Acquisition)
Directorate of Computer Resources

1 Atch
Small Computer Specification

SECTION C: DESCRIPTIONS/SPECIFICATIONS

1. General. These specifications describe the necessary hardware/software and services that will be used to support the microprocessor-based systems for the Department of Defense. The contractor shall provide the supplies and services under this contract, as ordered, according to the specifications stated in this section. The requirements stated in this section are mandatory and are stated in terms of the minimum capacities, rates of operation, and characteristics required by the government. Any additional components or features needed to satisfy the specified performance and configuration requirements must also be provided. Requirements may be satisfied by hardware, software, firmware or combinations thereof.

2. System Requirement. This specification requires a basic small computer system (Basic System) with a selection of compatible peripheral devices, CPU and main memory expansion, communications, software and support options that will be installed at Government locations throughout the world. These Small Computer Systems will be individually configured for stand-alone single user applications with communications and software compatibility and transportability that will allow effective integration with other DOD programs.

3. Environmental and Physical Facilities. The system shall be capable of normal operation within the physical facilities and throughout the range of power and environmental tolerances stated below.

a. Facilities:

(1) Floor space. The small computer system, including peripherals and workstation furniture, shall not exceed 75 square feet of floor space.

(2) Access Route. No special off-load, delivery routing, or set-up considerations are necessary. All components of the small computer system must be capable of being delivered through 26-inch wide doorways.

(3) Power. All equipment must be capable of operating with 105-125 VAC, 60 Hz+ or -1% and 210-240 VAC, 50 HZ+ or -1% Single Phase Power. To change voltage and frequency must not require soldering, special tools, a maintenance technician, or affect the warranty. Examples of acceptable methods are a switch, a strap requiring only a screwdriver or a movable transformer tap using some type of connector (so as not to require soldering).

3. Environment Conditions. No special site air conditioning or environment conditioning will be provided. The system must be capable of stand-alone operation within a normal office environment, with a temperature range of 50 to 100 degrees F and humidity range of 30 to 90 percent (non-condensing).

4. Conformance to Federal Information Processing and Telecommunications Standards (FIPS Pubs). Equipment and software must conform to the Federal Information Processing Standards (FIPS PUBS) listed in Section J, Attachment 2.

5. Configuration Requirements. The small computer system must provide a range of configuration options from a minimum which is the Basic System (CLIN-0001 hardware, software and data) up to any combination of additional orderable components (CLINs 0010 to 0020 and 0025 to 0043) that the system can support. Each system will be configured in accordance with the individual user's requirements by stipulation of the required orderable hardware and software on the delivery order. Expansion of installed systems by addition of orderable hardware and software will be ordered in the same manner. All additional orderable components as well as the Basic System must be field installable by user personnel in accordance with the installation manual provided, but without any requirement for special tools or training.

6. CLIN 0001 Basic System. The Basic System must meet the following requirements:

a. CPU.

(1) A processor capable of running object code software written for the CP/M 2.2 or later (8 bit) operating system.

(2) A bus structure having a minimum of three vacant board slots, in addition to all other requirements of the Basic System.

b. Random Access Memory (RAM). 64KB of main memory of which 48 KB Transient Program Area (TPA) is available.

NOTE: TPA - is the segment of available user memory that holds programs loaded from disk under command of the operating system. TPA does not include that portion of memory which contains the operating system but only that area available to the user after the operating system has been loaded.

c. Ports.

(1) One RS-232C port is required to interface a video display to the small computer if a VDU is not already part of the small computer.

(2) A port must be available for use by the printer.

(3) Two spare serial, RS-232C compatible asynchronous communication ports must be available for other uses and meet the following requirements:

(a) Character Code: ASCII

(b) Connector: DB-25

(c) Data format-user selectable with the following characteristics:

1 Number of data bits: 7 or 8 bits.

2 Number of start bits: One.

3 Number of stop bits: 1, or 2.

4 Parity: Odd, even, or none.

5 The start, stop, and parity bits are automatically put on the line in proper sequence.

6 Communication rate: 300, 1200, 2400, 4800, 9600 bits per second.

7 RS-232C signals controlled:

a. Transmit data.

b. Request to send.

c. Data terminal ready.

8 RS-232C signals monitored:

a. Receive data.

b. Clear to send.

c. Data set ready.

d. Ring detect.

e. Carrier detect.

d. Floppy Disk Drives.

(1) The on-line removable storage capability must consist of at least two 5 1/4inch floppy disk drives.

(2) Each drive must have a minimum formatted capacity of 320KB.

(3) 10 Floppy disks must be provided.

(4) The capability to connect an 8 inch floppy disk drive.

e. Keyboard/Video Display Unit (VDU). The VDU must consist of an alphanumeric keyboard and an alphanumeric display. When the terminal receives the ASCII "BEL" character, or its equivalent, an audible tone or "Beep" must be sounded. In addition, the following capabilities must be provided:

(1) Keyboard

(a) The keyboard must be capable of generating the ASCII 128-character subset.

(b) The keyboard must be a standard typewriter style keyboard.

(c) A repeat function is required for all printable ASCII characters, cursor controls, and backspace functions.

(d) Control keys must be provided for "carriage return" and backspace functions.

(e) The keyboard must have a minimum of eight user programmable function keys.

(f) The keyboard must have a numeric keypad to the right of the character keys and allow numeric entries from either the regular character keys or the numeric keypad.

(2) Video Display.

(a) The video display must display a minimum of 24 lines of at least 80 characters each.

(b) Characters displayed must consist of the ASCII 95-character subset.

(c) If the dot matrix character generation technique is used, the matrix must be at least 5X9.

(d) Full descenders will be used on the lowercase "g, j, p, q, y" and appropriate special characters.

(e) A visible cursor denoting the next character position must be implemented in such a manner that its location is obvious to the operator and does not obscure any information (excluding underline) which may be currently displayed at that position.

(f) The cursor must be addressable and the capability must be provided for the applications program to clear the display and to position the cursor at any location on the screen.

(g) The VDU must have a non-glare viewing surface.

(h) Reverse video or bright/dim video capabilities under application program control must be provided.

(i) Brightness must be externally adjustable by the terminal operator.

(j) A minimum 11-inch screen measured diagonally is required.

(k) The display must be capable of memory map graphics.

(l) The display must have a green or amber screen.

f. Software. All manufacturer's software and updates thereto during the contract life must be made available to the government.

(1) Operating System. The operating system must recognize and execute the same command set as CP/M version 2.2 or later versions as published by Digital Research.

(2) BASIC Interpreter. BASIC interpreter such as Microsoft BASIC Interpreter or equivalent.

(3) Diagnostic Software. Diagnostic software which will test electronic circuitry and mechanical components of the CPU, peripheral devices, and the communications interface. Diagnostic software may be used in conjunction with diagnostic hardware circuitry. The malfunction detection and isolation must be accomplished without the use of external electronic and calibration test equipment. The diagnostic software must:

(a) Detect and isolate malfunctions in the CPU, device controller(s), and peripheral devices.

(b) Be capable of being loaded, executed, and produce results that can be interpreted by a user.

(c) Be reusable to enable repetition (looping) of all or part of the test routine without reinitializing the entire diagnostic software package.

g. Documentation. All manfacturer's documentation and updates thereto during the contract life shall be made available to the government.

(1) Owner's Manual - operating instructions for the Basic System.

(2) Technical Reference Manual

(3) Installation Guide - Assembly and component interconnect instructions for the Basic System.

(4) BASIC Programming Manual

(5) Diagnostic Manual - Instructions for the use of the diagnostic software, interpretation of diagnostic messages and associated repair procedures.

7. CLINS 0002 to 0009. Orderable parts. The following Basic System Components shall be separately orderable as spares for use with Basic Systems in locations where operational reliability requires the immediate availablility of these components:

a.	CLIN 0002	CPU
b.	CLIN 0003	64kB RAM
c.	CLIN 0004	Video Port
d.	CLIN 0005	Printer Port
e.	CLIN 0006	Asynchronous Port
f.	CLIN 0007	5 1/4" Floppy Disk Drive
g.	CLIN 0008	Keyboard
h.	CLIN 0009	Video Display
i.	CLIN 0022	Replacement Copy of 8 Bit Operating System
j.	CLIN 0023	Replacement Copy of Basic Interpreter
k.	CLIN 0024	Replacement Copy of Diagnostic Software

3. CLINS 0010 to 0021. Additional Orderable Hardware. The following CLINS shall be orderable to expand the Basic System's hardware. Each orderable item will include the associated software support (e.g. hardware drivers for the disk and printer devices) and one copy of all the applicable manuals. (e.g., Owner's Manual, Technical Reference Manual, Installation Guide and Diagnostic Manuals).

a. CLIN 0010 CPU. The processor must be able to execute one of the instruction sets of the 8086/8088, or 68000 microprocessor. It must be available as an option to the basic CPU configuration if the basic configuration cannot execute one of these instruction sets. This option shall include a minimum of 48 KB of TPA.

b. CLIN 0011. Memory Expansion. The 16-bit processor system must be expandable to a minimum of 256KB.

c. CLIN 0012. Floppy Disk Drive. One IBM 3740 compatible 8-inch floppy disk drive with the capability of reading and writing single density disks with a formatted capacity of at least 250 KB. Each drive shall be supplied with ten 8-inch floppy disks.

d. CLIN 0013. Hard Disk. A hard disk drive with a minimum of 5MB formatted capacity. A hard disk back-up capability must copy 5MB of data stored on the hard disk, and subsequently restore this data to the hard disk.

e. CLIN 0014. Dot Matrix Impact Printer (small carriage). The dot matrix impact (small carriage) printer must:

(1) Print a minimum of 80 characters per second at 132 characters per print line (compressed print acceptable).

(2) Have dot addressable graphics.

(3) Use an operator adjustable pin feed tractor for positive form registration and movement and a friction feed platen for single sheets and letterhead.

(4) Accept forms from 4 to 9 1/2-inches wide.

(5) Print full descenders on the lower case characters "g, j, p, q, y" and appropriate special characters.

(6) Print 6 and 8 lines per inch, operator selectable.

(7) Print clearly on up to and including 3-part paper forms.

(8) Print the ASCII 95 character subset.

(9) Have operator controls for power, online/offline, advance to top of form, and manual adjustment of vertical and horizontal paper alignment.

(10) Under program control, overprint (print without advancing), line feed, and form feed.

(11) Interface through the available printer port provided in the Basic System.

(12) Include 2 ribbons.

f. CLIN 0015 Dot Matrix Impact Printer (large carriage, faster print speed). The dot matrix impact (large carriage) printer must:

(1) Print a minimum of 120 CPS at 132 characters per print line at 10 characters per inch.

(2) Have dot addressable graphics.

(3) Use an operator adjustable pin feed tractor for positive form registration and movement and a friction feed platen for single sheets and letterhead.

(4) Print the ASCII 95 character subset.

(5) Accept forms from 4 to 14 7/8-inches wide.

(6) Print full descenders used on the lower case characters "g, j, p, q, y" and appropriate special characters.

(7) Print 6 and 8 lines per inch operator selectable.

(8) Print clearly on up to and including 3-part paper form.

(9) Have operator controls for power, online/offline, advance to top of form, and manual adjustment of vertical and horizontal paper alignment.

(10) Under program control, overprint (print without advancing), line, feed, and form feed.

(11) Interface through the printer port provided in the Basic System.

(12) Include 2 Ribbons.

g. CLIN 0016. Letter Quality Printer. The letter quality printer must:

(1) Print at least 30 characters per second.

(2) Print 132 characters per line.

(3) Have a pressure-feed mechanism, and tractor feed.

(4) Print the complete 95 character ASCII subset.

(5) Have operator selectable print spacing of 10 and 12 characters per inch horizontally.

(6) Have changeable print elements.

(7) Accept forms form 4 to 14 7/8-inches wide.

(8) Print clearly on up to 3-part paper form.

(9) Have proportional spacing.

(10) Include one 10 pitch, one 12 pitch and one OCR-B, size 1, print elements.

(11) Interface through the printer port provided in the Basic System.

(12) Include 2 Ribbons.

h. CLIN 0017. Acoustic Modems. The acoustic modem must be Bell 103A compatible with the capability to select full or half-duplex, and originate or answer modes, and have a transfer rate of 300 baud (asynchronous).

i. CLIN 0018. Direct Connect Modem. The direct connect modem must be Bell 212A compatible with the capability to select full or half-duplex, originate or answer modes and select a transfer rate of 300 or 1200 baud (asynchronous). Coupling to phone lines will be by direct connection using standard "modular" phone jacks (RJ11) hardware. Signals must conform to FCC regulations.

j. CLIN 0019 Synchronous Port. One synchronous communications port with the following characteristics required:

(1) Character Code: ASCII

(2) Connector: DB-25

(3) Data format-user selectable with the following characteristics:

(a) Parity: Odd, even, or none.

(b) Synchronous character hardware generator (enable, disable).

(c) Generate up to four synchronous characters.

(d) Synchronous characters purged by hardware (enable, disable).

(e) Data transmission rate: 1200, 2400, 4800, 9600 bits per second.

(f) RS-232C Signals controlled:

1. Transmit data.

2. Request to send.

3. Data terminal ready.

4. Transmit clock (enable, disable).

(g) RS-232C signals monitored:

1. Received data.

2. Clear to send.

3. Data set ready.

4. Ring detect.

5. Carrier detect.

6. Transmit clock.

k. CLIN 0020. Graphics Plotter. The plotter must satisfy the following characteristics:

(1) Resolution: less than or equal to .01 inch.

(2) Repeatability: less than or equal to .01 inch.

(3) Plotting area: At least 10 inch x 15 inch.

(4) Multipen changer, with programmable pen selection from at least a four-pen corral.

(5) Plots on plain bond paper and on clear acetate (transparency) sheets.

(6) Plot speed of at least 3 inches per second.

(7) Include one extra set of pens.

1. CLIN 0021 Spare Parts. The spare parts kit shall consist of all hardware components that can be removed and replaced in the field and that are necessary to support a 95 percent level of operational availability for 90 days. Individual parts will be listed and priced separately, and be available so that spare parts can be ordered as needed to be consistent with the installed hardware configuration, other operational requirements, replenish spare parts kits and replace failed parts. A telephone answering service for ordering spare parts must be available continuously, 24 hours per day, 365 days per year. Shipment of parts must occur within 8 normal work hours from a centralized facility in each of 3 areas, the Pacific (e.g. Hawaii), Europe (e.g. Germany) and the continental United States.

2. CLINs 0025 to 0043. Additional Orderable Software. The software provided must include a family of programming languages that will load, link software library routines and create object files that can be used by all the provided languages. (CLIN 0024 Basic Interpreter and CLINs 0026 through 0035.) Each orderable item will be furnished with one copy of all the applicable manuals. All manufacturer's updates to software and associated documentation during the contract life must be made available to the Government. The examples of specific software packages provided in the following line items are only representative of acceptable software. They are not exclusionary in nature, and other functionally similar software may be provided.

a. CLIN 0025. 16 bit Operating Systen. The 16 bit processor operating system (e.g., MS-DOS derivatives, UNIX derivatives, p-System, CP/M-86) must be operable on the microcomputer systems of more than one manufacturer.

b. CLIN 0026. BASIC Compiler (8-bit). The BASIC compiler must be compatible with the BASIC interpreter provided with the Basic System (for example, Microsoft compiler BASIC).

c. CLIN 0027. BASIC Compiler (16-bit). The BASIC compiler must be compatible with the BASIC interpreter provided with the Basic System.

d. CLIN 0028. COBOL Compiler (8-bit). The COBOL compiler (8-bit) must satisfy the requirement for the COBOL compiler (Low Level) in accordance with FIPS Pub 21-1 and as defined in ANS X3.23-1974 (for example, Microsoft COBOL V4.40).

e. CLIN 0029. COBOL Compiler (16-bit). The COBOL compiler (16 bit) must satisfy the requirements for the COBOL compiler (Low Level) in accordance with FIPS Pub 21-1 and as defined in ANSI X3.23-1974.

f. CLIN 0030. MACRO ASSEMBLER (8-bit). The MACRO ASSEMBLER must be capable of program development and macro-assembly (for example, Microsoft MACRO-80).

g. CLIN 0031. MACRO ASSEMBLER (16-bit). The MACRO ASSEMBLER must be capable of program development and macro-assembly.

h. CLIN 0032. FORTRAN Compiler (8-bit). A FORTRAN compiler must be provided (For example, Microsoft FORTRAN-80).

i. CLIN 0033. FORTRAN Compiler (16-bit). A FORTRAN compiler must be provided.

j. CLIN 0034. PASCAL Compiler (8-bit). A PASCAL compiler must be provided (for example, Microsoft PASCAL-80).

k. CLIN 0035. PASCAL Compiler (16-bit). A PASCAL compiler must be provided.

l. CLIN 0036. Word Processing Software Package (8-bit). The word processing system must include a full screen text editor, file merge utility, and spelling checker (for example, Wordstar, Spellstar, Mail Merge). All word processingutilities must be compatible with the word processing package.

m. CLIN 0037. Word Processing Software Package (16-bit). The word processing system must include a full screen text editor, file merge utility, and spelling checker. All word processing utilities must be compatible with the word processing package.

n. CLIN 0038. Data Base Management System (8-bit). A relational data base management system software package must be provided (for example, dBASE II).

o. CLIN 0039. Data Base Management System (16-bit). A relational data base management system software package must be provided.

p. CLIN 004C. Spreadsheet Program (8-bit). A spreadsheet program software package must be provided (for example, Supercalc).

q. CLIN 0041. Spreadsheet Program (16-bit). A spreadsheet program software package must be provided.

r. CLIN 0042. Graphics Software (8-bit). The graphics software (8-bits) must be capable of producing graphic images (i.e., plots, graphs, drawings, etc.) on both the supplied video display unit and the plotter. This graphics software must be able to use data generated by a BASIC program and include the following capabilities:

(1) Bar charts with vertical and horizontal orientation, and color shading for the plotter.

(2) Pie charts with color shading for the plotter.

(3) Line plots with multiple line types (minimum of 5) and color enhancing on the plotter (different color lines).

(4) Composite Plots. Multiple plots on the same screen or chart, consisting of a mixture of plot types on the same screen or chart (i.e., bar charts with line plots superimposed) or multiple plots/charts on the same screen or chart (i.e., four different bar charts or line plots).

(5) User controlled labeling, scaling.

(6) Data entry for the graphs either from the keyboard or from a data file stored on disk or directly from output of a BASIC program.

(7) Character generation with any height, width, and rotation.

(8) Designation of the plot area limits on the screen and plotter.

s. CLIN 0043. Graphics Software (16-bit). The graphics software (16 bit) must satisfy same requirements as specified for the graphics software (8 bit) in CLIN 0042.

10. CLIN 0044 Maintenance. Maintenance shall be based on the diagnosis of failures and replacement of field removable components at the operational locations by the user utilizing the diagnostic software, maintenance instructions included in the manufacturer's documentation, spare parts kits and replacement spare parts. The contractor shall provide a telephone maintenance assistance service to help when the user requires assistance to resolve failures. This service must be available to each site Monday to Friday, excluding Federal holidays. The contractor shall also provide for the inspection, testing and repair of failed parts and components that have been returned from the field as needed and determined on a case by case basis.

11. Line Item 0045 Data. The contractor shall provide data as specified in the Contract Data Requirements List, DD Form 1423, Section J, Exhibits A and B.

APPENDIX III

The Educational and Research Computer Center must do long-range planning for computer resources. As it now stands, here are the plans through FY89. Any implementation of computers in the dorms must be worked into these plans and supplemental funding obtained in the near term.

MEMO FOR RECORD 30 March 1983

SUBJECT: DFSEC Projected Acquisitions

TO: DF

1. The Computer Center is functionally organized into nine application areas. Each area generally has its own processor and is managed and funds projected separately. We are able, however, to "transfer" funds from one application to another. Projected funding for each application area is contained in Attachment 1. Funding is specified as purchase (P), lease (L), software (S/W), or maintenance (M). Although inter-application transferring is possible, it is difficult to transfer the type of money from one category to another, i.e., to use lease money to purchase equipment.

2. Funds are projected three years in advance for a five year period. In November of each year AD travels to Washington D.C. to justify the next fiscal year's requested (projected) funds. Our FY84 projected funds have been approved. The FY85-89 projected funds have not been approved. Because Attachment 1 contains a "lot of numbers" I will highlight our major projections by year and again by application.

DFSEC Projected Major Acquisitions by Year

FY83

$ 40K (L)	-	Lease 4 color TERAK terminals.
$186K (P)	-	Complete three microprocessor labs: a hardware lab located in EE; a software lab located in DFSEC, and a control systems lab located in ASTRO. 20-22 new micros for the hardware and software labs. 3 INTEL MDS 220 for control system lab.
$ 30K (P)	-	420MB disk drive for VAX B.
$ 17K (P)	-	Upgrade flatbed plotters and a CALCOMP interface.
$ 9K (P)	-	6 word processing terminals/printers for DF.

FY84

$170K (P/L)	-	Library turn-key system for circulation, card catalog and acquisition.
$ 80K (L)	-	Continued lease of FY83 color TERAKs and lease 4 additional ones.
$ 11K (P)	-	Upgrade DFAN wind tunnel system.
$ 37K (P/L)	-	Upgrade memory and terminals for basic programming skill (CS100) system.
$ 8K (P)	-	Upgrade communication and memory on word processor.

FY85

$109K (P)	-	Color graphic system for ASTRO simulator; plotter upgrade.
$ 80K (L)	-	Continued color TERAK lease.
$233K (P)	-	75 micro systems for an unspecified application.
$114K (P/L)	-	Library turn-key system (second payment).

FY86 (NOTE: Additional funds may be requested for FY86-90 in the Sep 83 POM)

$ 75K (P)	-	Replace DFEE EDUCOMP systems.
$106K (P)	-	Replace ASTRO G-P6 analog systems.
$110K (P)	-	Upgrade B6900.

FY87

$ 98K (P)	-	Hardware for networking.

FY88

$120K (P)	-	Replace DFAN wind tunnel computer.
$420K (P)	-	Replace VAX A (CS100).

FY89

$425K (P)	-	Replace VAX B (CAI/Graphics).

DFSEC Project Major Acquisitions by Application

NETWORKS

FY83 a single ARPA network station will be purchased which will dial into the Denver connection. The station will be a small microcomputer with separate processing, storage and print capability. Projected FY87 funds ($98K) are to purchase connect hardware to the local area network our communication squadron will install. Additional FY86 funds will be projected as I believe the local area network will be installed by then.

GRAPHICS

The VAX B graphics terminals, plotters and digitizers will be maintained thru FY88. FY89 funds ($425K) are projected for total system replacement. A major ($98K) purchase of an ASTRO simulator graphics terminal is projected by FY85. If the graphics system did not share resources with CAI, these projected funds would be adequate.

CAI

The VAX B CAI system will be maintained, increasing some memory, disk and terminals. Funds are projected for minor software purchases and 8 additional color TERAKs (4 in FY83, 4 in FY84). These are not adequate for the expected CAI growth. Additional funds will be needed before FY86.

MICROPROCESSORS

Three well equipted microprocessor labs will be realized in FY83 ($186K). These labs satisfy expected needs for the study and applications unique to microprocessors. Projected FY85 funds ($238K) will allow purchase of 75 micros for other applications, such as CAI laboratories, administrative systems for departments, stations for connection to VAX A & B, stand-alone support of labs (Chemistry, Physics, etc.), and initial stations for potential micro systems in the dorms.

DATA ACQUISITION

The ASTRO analog lab will be replaced in FY86 ($106K). The DFAN wind tunnel will be replaced in FY88 ($120K).

DATA FORMATTING (B6900)

The B6900 workload should decrease as more applications go to the micro-processor labs, graphics system and additional micros. FY86 funds are projected for upgrade of memory and disk (FY86). These funds, presently, are not expected to be needed.

LIBRARY

Initial funding for the turn-key library system was over $100K short, thus, split year procurement between FY84 ($168K) and FY85 ($114K) will occur during the summer, 1984. The turn-key $282K system should satisfy the library's needs through 1990. They will be short funds for database conversion.

WORD PROCESSING

Projected funding for word processing was stopped in 1982 because AD and DA are taking responsibility for all USAFA word processing needs and funding. Over $250K is projected in AD's FY85 budget to replace the current 11/70 system. DF's "fair share" is unknown. I plan on projecting "significant" FY86 funds to support a DF office information system. In the interium I plan to acquire VT100s and printers for every department which will be compatible with the FY85 base-wide replacement system. Funds for these will come from DA, AD fall out and if necessary, other DFSEC projected applications funds. The planned office information system would probably be an extension of the FY85 base-wide buy.

3. I expect and hope some questions will arise. I look forward to giving additional details and brain-storming senerios.

JONATHAN L. STEVENS, Capt, USAF
Director, Education & Research
Computer Center

Attachment 1

	FY83	FY84	FY85	FY86	FY87	FY88	FY89	FY90
Networks	14K(P) 2K(S/W) 1K(M)	1K(M)	1K(M)	1K(M)	98K(P) 1K(M) 5K(S/W)			
Graphics	20K(L) 17K(P)	50K(L) 2K(M)	50K(L) 3K(M) 109K(P) 1K(S/W)	50K(L) 16K(M)	50K(L) 16K(M)	13K(M)	425K(P) 25K(S/W) 29K(M)	
CAI	20K(L) 10K(P) 1K(M) 6K(S/W)	30K(L) 3K(P) 2K(M)	27K(P) 30K(L) 5K(M) 3K(S/W)	30K(L) 5K(M)	30K(L) 5K(M)			
Microprocessors	12K(M) 4K(S/W) 186K(P)	12K(M) 4K(P)	13K(M) 2K(S/W) 238K(P)	27K(M) 5K(S/W) 75K(P)	29K(M) 10K(P)	17K(M)	17K(M)	
Data Acquisition		11K(P) 1K(S/W) 1K(M)	1K(M)	106K(P) 1K(M)	1K(M)	120K(P) 3K(M)		
Data Formatting	3K(M) 30K(P)	1K(M)	3K(M)	18K(M) 110K(P) 11K(S/W)	18K(M)	18K(M)		
Programming Skill Development	15K(L) 6K(P)	22K(P) 15K(L) 3K(S/W) 1K(M)	15K(L) 4K(M)	15K(L) 4K(M)	15K(L) 4K(M)	420K(P) 20K(M)		
Library	148K(P) 3K(M) 20K(S/W)	65K(P) 15K(M) 49K(S/W)	15K(M) 20K(S/W)	15K(M) 20K(S/W)	15K(M) 20K(S/W)	18K(M)	12K(M)	
Word Processing	9K(P)	8K(P)						

		FY83	FY84	FY85	FY86	FY87	FY88	FY89	FY90
TOTALS	P =	243K	196K	447K	291K	108K	540K	425K	
	L =	64K	95K	95K	95K	95K	-	-	
	S/W =	12K	24K	55K	36K	25K	20K	25K	
	M =	17K	23K	45K	87K	89K	86K	58K	
		356K	338K	642K	509K	317K	646K	508K	

All values in 1,000's / L=Lease P=Purchase M=Maintenance S/W=Software


DAT
FILM